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ECMO Use as a Bridge to Pediatric Lung Transplantation

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The number of pediatric lung transplant procedures performed annually worldwide increases continuously with comparable outcomes between adults and children, offering carefully selected children a survival benefit and improvement of health related quality of life.¹⁻³ However, there is ongoing lack of suitable donor organs, and extended waiting list times bear the risk of death on the waiting list. Furthermore, this steady increase in the number of lung transplant procedures has led to an increased competition between children and adults for suitable donor organs, resulting in a higher ratio of waiting list deaths in children compared to adults in some countries.

As a consequence of this, the need for respiratory support to bridge children to lung transplantation is more often required, including extra-corporeal membrane oxygenation (ECMO) support. Up to now, only scarce reports have been published on the use of ECMO in children as a bridge to lung

transplantation with mixed outcomes.

One of the first reports on the use of ECMO in human lung transplantation dates back to 1978, well before lung transplantation evolved as an accepted therapy for end-stage lung disease. A 19-year old lung transplant recipient who was placed on ECMO support temporarily due to insufficient pulmonary graft function early post-operatively, died 18 days post-transplantation of bronchial dehiscence.⁴ Since then, only isolated reports on the use of ECMO as a bridge to lung transplantation in pediatric and adolescent recipients have been published with variable results.⁵⁻⁷

In a recent retrospective study from St Louis, the largest pediatric lung transplant program in the world, Puri et al demonstrated that ECMO use before or after lung transplantation is associated with a significant morbidity and mortality in children requiring peri-operative ECMO support (6/15 children bridged on ECMO to transplantation survived to hospital discharge). Children placed on venovenous (VV) compared to venoarterial (VA) ECMO had a better chance of overall survival, in particular, if weaned off ECMO prior to transplantation. The authors concluded to de-list patients in the future if ECMO was instituted for respiratory failure.⁷

Many other pediatric lung transplant centers share these concerns and therefore consider the need for ECMO to be a contraindication for lung transplantation. However, the adult experience on the use of ECMO as a bridge to lung transplantation seems somewhat different. A recent retrospective adult study of two Scandinavian transplant centers reports an excellent short-term outcome with >90% 1-year survival after the use of ECMO support as a bridge to lung transplantation.⁸ The Pittsburgh Group has also recently shown that an acceptable mid-term survival is achievable in carefully selected adults bridged on ECMO to lung transplantation, despite higher peri-operative mortality.⁹ Hence, ECMO is currently accepted at selected adult transplant centers as bridge to lung transplantation.

My personal clinical experience would suggest that ECMO can be safely used as a bridge to lung transplantation in carefully selected children. In experienced transplant centers, the use of pre-operative ECMO support may not generally have a negative impact on short-term outcome in pediatric lung transplant recipients.



It is important to report additional experience to contribute to our knowledge concerning this sophisticated, high resource-consuming method of support as a bridge to lung transplantation. A multi-center study to collect a larger cohort of children who underwent lung transplantation after ECMO support and to evaluate key factors associated with inferior outcomes following transplantation is needed and currently on the way (Jackson Wong, personal communication). This international study will examine many risk factors involving the use of ECMO in this very compromised group of children waiting for a major transplant procedure.

In conclusion, the pediatric lung transplant community needs to move forward and pursue further studies to evaluating risk factors for morbidity and mortality and long-term survival of children on ECMO as a bridge to lung transplantation which may lead to improved overall outcomes in the future.

The issue of ECMO as a bridge to lung transplantation in children will also be discussed at the upcoming **ISHLT 2012 Annual Meeting and Scientific Sessions** in Prague during **Concurrent Symposium 18: Challenges in Pediatric Lung Transplant** on Friday, April 20 from 11:45 AM - 1:00 PM.

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